



THE U.S. DEPARTMENT OF ENERGY'S OFFICE OF FOSSIL ENERGY

FOSSIL ENERGY

TAPPING THE FULL POTENTIAL OF AMERICA'S TRADITIONAL ENERGY RESOURCES

FOSSIL ENERGY—COAL, OIL AND NATURAL GAS—
IS ESSENTIAL FOR U.S. ECONOMIC GROWTH AND
NATIONAL SECURITY, BOTH NOW AND IN THE FUTURE.

ENSURING FOSSIL ENERGY RESOURCE AVAILABILITY

Fossil energy—coal, oil and natural gas—is essential for U.S. economic growth and national security, both now and in the future.

Fossil fuels currently account for a combined 83 percent of domestic energy consumption, a share the Energy Information Administration projects will be maintained through at least 2030.

Consequently, the U.S. Department of Energy's (DOE) Office of Fossil Energy (FE) has a key role in helping America meet its continually growing need for secure, reasonably priced and environmentally sound fossil energy supplies. Put simply, FE's primary mission is to ensure the nation can continue to rely on traditional resources for clean, affordable energy while enhancing environmental protection.

FE's staff consists of about 1,000 scientists, engineers, technicians and administrative staff, with headquarters locations in downtown Washington, D.C., and in Germantown, Maryland. The office also includes the National Energy Technology Laboratory (NETL). Key programs at NETL include the development of advanced coal, natural gas and oil technologies. FE also maintains and operates the Strategic Petroleum Reserve, based in New Orleans, La.; the Northeast Home Heating Oil Reserve, located in the northeastern U.S., and the Rocky Mountain Oilfield Testing Center in Casper, Wyoming.

INNOVATIVE
FE RESEARCH AND
DEVELOPMENT (R&D)
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EFFORTS TO MAKE POSSIBLE
GREATER RELIANCE ON THE
NATION'S MOST ABUNDANT
ENERGY RESOURCE: COAL.

Innovative FE research and development (R&D) programs are leading efforts to make possible greater reliance on the nation's most abundant energy resource: coal. Chief among these is the Clean Coal Power Initiative, which will help advance FE's carbon dioxide capture and storage (CCS) goals by partnering with industry to build and operate near-zero atmospheric emissions power plants. Another critical initiative is the Industrial Carbon Capture and Storage Program, which applies CCS technologies to industrial plants and explores the beneficial reuse of carbon dioxide.

The American Recovery and Reinvestment Act of 2009 allocated FE \$3.4 billion to help fund activities targeted at expanding and accelerating the commercial deployment of CCS technology. This investment has provided a key thrust to the advanced coal program by accelerating the advances needed for future plants with CCS.

Other key coal R&D programs include pollution control innovations for new and existing power plants; improved gasification technologies; advanced combustion systems; development of stationary power fuel cells; improved turbines for future coal-based combined cycle plants; and creation of a portfolio of technologies that can capture and permanently store greenhouse gases.

About two-thirds of the nation's oil reserves cannot be extracted economically with conventional means. Historically, FE programs have examined how more efficient approaches for improved extraction might enable this unused resource to play an expanded role in supplementing the national petroleum supply. In recent years, the Office has also looked at R&D on how to tap the huge potential of natural gas in the form of methane hydrates.

As part of its responsibility for the Strategic Petroleum Reserve, FE maintains the Reserve at a current 727 million barrel capacity. FE also manages the emergency Northeast Home Heating Oil Reserve and the Naval Petroleum and Oil Shale Reserves, which controls oil-bearing lands owned by the U.S. government.

In total, FE's activities help ensure that as the nation strives to reduce its reliance on imported energy sources, new energy technologies and methodologies will be in place to promote the efficient and environmentally sound use of America's abundant fossil fuels.

OFFICE OF FOSSIL ENERGY FACILITIES DEVELOP INNOVATIVE TECHNOLOGIES

FE operates two key facilities aimed at developing innovative future fossil energy technologies—the National Energy Technology Laboratory (NETL) and Rocky Mountain Oilfield Testing Center (RMOTC).

NETL is the only U. S. national laboratory devoted to fossil energy research and supports the Department of Energy's mission to advance the national, economic and energy security of the United States.

NETL has locations in Morgantown, W.Va.; Pittsburgh, Pa.; Houston, Texas; Albany, Ore.; and Fairbanks, Alaska, but its reach extends to contracted research in 47 states and more than 40 foreign countries. NETL's research portfolio includes more than 1,800 projects with a total value of over \$9 billion and private sector cost-sharing of over \$5 billion. NETL programs are aimed at enabling domestic coal, natural gas and oil to economically power the nation's homes, industries, businesses and transportation sectors in an environmentally conscious manner, including greenhouse gas emissions control.

Among other activities, NETL conducts research in carbon capture and storage, clean power generation, hydrogen fuel cells, and climate change mitigation; manages research partnerships in energy efficiency and renewable energy; and supports DOE's Office of Electricity Delivery and Energy Reliability. In addition to research conducted on site, the majority of NETL's funding is focused on

research and development (R&D) partnerships, cooperative R&D agreements, financial assistance and contractual arrangements with universities and the private sector. The laboratory also supports educational initiatives at all levels. These combined efforts focus a wealth of scientific and engineering talent on creating commercially viable solutions to national energy and environmental problems.

RMOTC conducts technology research that contributes to the nation's energy security, economic growth or technology leadership. Its testing capabilities include not only a focus on oil and gas production, but also drilling, well completions, renewable energy, techniques having oilfield applications, flow assurance, bioremediation, and geology and petrophysics. The Center's partners include service companies and equipment manufacturers who test new ideas and products leading to increased recovery or reduced operating costs. In addition,

national laboratories and government organizations can field test theoretical laboratory assumptions in a real world setting. Universities teaching theory in the classroom can demonstrate real-life field application. RMOTC project management and administrative offices are located in Casper, WY, and the Center's primary test site is a 10,000 acre operating oil facility at the Naval Petroleum Reserve No. 3 (NPR-3) Teapot Dome Field.

FE
OPERATES
TWO KEY FACILITIES
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INNOVATIVE FUTURE FOSSIL
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THE NATIONAL ENERGY
TECHNOLOGY LABORATORY
(NETL) AND ROCKY
MOUNTAIN OILFIELD
TESTING CENTER
(RMOTC).

REALIZING THE PROMISE OF CLEAN COAL

Imagine a future in which power from our nation's most abundant and lowest cost energy resource is pollution-free. Imagine a future in which we no longer have concerns about the effects of power and fuels production on the global climate of our children, or their children. Imagine a future in which America's energy security is strengthened by replacing increasing amounts of imported oil with clean-burning, affordable fuels made from resources that exist within our borders.

The Office of Fossil Energy's Office of Clean Coal is working to make this future possible. For the first time in the long history of fossil fuel use, we now see emerging from our laboratories and test sites the tools and technologies that can turn the concept of a virtually zero-emission—including carbon dioxide (CO₂)—coal-based energy plant into a viable reality, not 50 or 100 years into the future, but within the coming decade.

Through sustained investments in coal science and technology, and through partnerships with the nation's energy industry and increasingly with other nations, we hope to bring about a revolutionary change in the way power and fuels are produced from coal.



The Office of Clean Coal's carbon storage research involves injecting large volumes of CO₂ into geologic formations to study its behavior and validate safe and permanent storage.

While coal provides our country with both affordable electricity and energy security, growing concern over climate change, particularly CO₂ emissions, presents challenges and opportunities for an economy based predominately on fossil fuels. We are investing in advanced coal power systems that increase the efficiency of producing electricity and decrease emissions. Carbon capture and storage technologies are being developed to further reduce CO₂ emissions to levels that may be required to meet climate goals.

The Office of Clean Coal focuses on both the capture and storage aspects of CCS. Anchored by its Regional Carbon Sequestration Partnerships, the Office's carbon storage research involves injecting large volumes of CO₂ into geologic formations to study its behavior and validate safe and permanent storage. In parallel, capture research focuses on developing advanced oxy-combustion, gasification, and hydrogen turbines for a new breed of highly efficient, near-zero emission coal power plants. Developing efficient CCS technologies for the existing coal power plant fleet currently providing about half of the nation's electricity is also a program priority. Given the nation's expected continued reliance on coal for electricity production, developing improved efficiencies and innovative emissions control technologies for new and existing plants is essential to ensure this domestic energy supply remains reliable and affordable, while meeting environmental objectives.

MAINTAINING EMERGENCY PETROLEUM RESERVES

In the event of a disruption in commercial fuel supplies, the United States can turn to two emergency stockpiles of petroleum maintained by the Office of Fossil Energy.

The Strategic Petroleum Reserve (SPR) is the largest government-owned inventory of emergency crude oil in the world. With a current capacity of 727 million barrels securely stored in deep, underground salt caverns along the Texas and Louisiana Gulf coasts, it represents a \$23 billion-plus investment in national security (\$5 billion for facilities; \$18 billion for oil acquisition).

The President has the authority to direct a drawdown and sale of SPR crude oil if he finds that a supply emergency exists or is imminent in order to protect the U.S. economy. SPR stocks can begin to flow to U.S. markets in as little as 13 days. For small or regional supply emergencies, the SPR can conduct limited exchanges (similar to loans) that require a contractor to return an equivalent value of crude oil, plus a premium, to the SPR within a certain date. In the aftermath of delivery disruptions caused by damage in the Gulf Coast by Hurricane Katrina in 2005 and Hurricanes Gustav and Ike in 2008, releases from the SPR played a critical role in stabilizing the nation's oil supplies.

FE manages the daily operations of the SPR from its headquarters in Washington, D.C. and its New Orleans, La., project management office. Federal and contract personnel are also stationed at the Reserve's four storage sites: the West Hackberry and Bayou Choctaw sites in southern Louisiana, and the Bryan Mound and Big Hill sites along the coastline of Texas.

The Northeast Home Heating Oil Reserve (NEHHOR) provides a supply of emergency fuel oil for homes and businesses in the northeastern United States, where about 69 percent of American households using heating oil are located.

Established in 2000, the NEHHOR is an “emergency buffer” that can supplement commercial fuel supplies should the heavily oil-dependent region be hit by a severe disruption in supplies. NEHHOR would provide the Northeast region supplemental supplies for about 10 days, the time required for ships to carry heating oil from the Gulf of Mexico to New York Harbor.

FE manages the NEHHOR from its Washington, D.C., headquarters. To hold the emergency stocks, commercial storage capacity is leased from private companies operating terminals in the Northeast seaboard.

Should a fuel crisis develop, FE has in place a rapid competitive sales process that would use an Internet-based online auction system. Emergency fuel oil could be delivered from the NEHHOR to customers in as little as one to three days.

**ENHANCED
NATIONAL SECURITY
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NATURAL GAS TECHNOLOGY PROGRAM

Enhanced national security and reduced climate change impact would be realized through expanded and diversified supplies of domestic natural gas—a relatively low-carbon fossil fuel—to meet the energy needs of American consumers.

Significant volumes of natural gas from non-conventional gas sources exist in the country. According to DOE’s Energy Information Administration, the technically recoverable U.S. shale gas resource is estimated at 827 trillion cubic feet, and production—utilizing technology pioneered by FE research—has increased fourteen-fold over the past decade. Also gas hydrate is an abundant, novel and potentially producible natural gas resource. If only 1 percent were produced, the U.S. could increase its recoverable gas resource base ten-fold. In addition, deepwater oil and gas resources continue to be an important long-term component of U.S. energy supply in all public and private forecasts.

Consequently, FE’s Office of Oil and Natural Gas has focused research on developing advanced technologies to improve the safety and environmental performance of detecting and producing natural gas from the abundant domestic non-conventional gas resources. The program will specifically focus more on quantifying potential risks and environmental impacts and developing technologies to mitigate them.